



REPORT OF SURVEY CONDUCTED AT

CITY OF CHATTANOOGA

CHATTANOOGA, TN

APRIL 1996

Best Manufacturing Practices

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BEST MANUFACTURING PRACTICES CENTER OF EXCELLENCE
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Foreword



This report was produced by the Best Manufacturing Practices (BMP) program, a unique industry and government cooperative technology transfer effort that improves the competitiveness of America's industrial base both here and abroad. Our main goal at BMP is to increase the quality, reliability, and maintainability of goods produced by American firms. The primary objective towards this goal is simple: to identify best practices, document them, and then encourage industry and government to share information about them.

The BMP program set out in 1985 to help businesses by identifying, researching, and promoting exceptional manufacturing practices, methods, and procedures in design, test, production, facilities, logistics, and management – all areas highlighted in the Department of Defense's 4245-7.M, *Transition from Development to Production* manual. By fostering the sharing of information across industry lines, BMP has become a resource in helping companies identify their weak areas and examine how other companies have improved similar situations. This sharing of ideas allows companies to avoid costly and time-consuming duplication of what others have already tried and learned from.

BMP identifies and documents best practices by conducting in-depth, voluntary surveys such as this one at the City of Chattanooga, Tennessee conducted during the week of April 22, 1996. Teams of BMP experts work hand-in-hand on-site with the company to examine existing practices, uncover best practices, and identify areas for even better practices.

The final survey report, which details the findings, is distributed electronically and in hard copy to thousands of representatives from government, industry, and academia throughout the U.S. and Canada – *so the knowledge can be shared*. BMP also distributes this information through several interactive services which include CD-ROMs, BMPnet, and a World Wide Web HomePage located on the Internet at <http://www.bmpcoe.org>. The actual exchange of detailed data is between companies at their discretion.

The City of Chattanooga agreed to become the first site for an Environmental Best Manufacturing Practices program survey. This city reached a critical juncture in its environmentally-influenced economic development when it was designated as one of the most polluted cities in the United States. Since that critical turning point, Chattanooga has evolved into a benchmark for environmental improvement with a strong commitment to sustainable development through economic growth. The City's journey was acknowledged in 1990 when the EPA recognized Chattanooga for its clean air and in 1995 designated it on Earth Day as America's most improved city.

The Best Manufacturing Practices program is committed to strengthening the U.S. industrial base. Survey findings in reports such as this one on the City of Chattanooga expand BMP's contribution toward its goal of a stronger, more competitive, globally-minded, and environmentally-conscious American industrial program.

I encourage your participation and use of this unique resource.

A handwritten signature in cursive script, reading 'Ernie Renner'.

Ernie Renner
Director, Best Manufacturing Practices

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Section 1

Report Summary

Background

Since its inception in 1985, the Best Manufacturing Practices (BMP) program has solicited and received feedback from its customers – the Federal Government and the U.S. industrial base. This dialogue has provided BMP with direction, generated new development, and highlighted the need for more focused efforts. In listening and responding to the needs of American companies and institutions, BMP has provided answers through technology transfer. These answers have resulted from conducting electronic, non-electronic, service industry, and educational surveys, as well as through more concentrated projects as in the 1990 Solderability Guidelines and 1993 Producibility Measurement handbooks.

Consequently, in early 1994 when industry spokesmen, government representatives, and BMP program participants discussed the broadening impact of environmental issues, BMP responded by establishing the Environmental Best Manufacturing Practices (EBMP) program. The charter for this special branch of BMP echoed that of its parent program in determining and disseminating information on environmental best practices in manufacturing and related arenas. In 1995, the EBMP concentrated on identifying exemplary programs and practices through quarterly meetings across the United States. These meetings were attended by companies such as Texas Instruments, Rockwell, and Hughes; and government entities such as the Army, Air Force, NASA, the Environmental Protection Agency, Oak Ridge National Laboratories, and the Tennessee Valley Authority. The academic institutions were represented by the University of Maryland, the University of Tennessee, and the University of Texas at Austin. Discussions during these meetings highlighted the need for specific, environmentally-focused surveys as the means to provide more information in this increasingly important area. As the result of one of these 1995 quarterly meetings, the City of Chattanooga, Tennessee volunteered to become the EBMP's initial environmental survey site.

It is perhaps appropriate for Chattanooga to host the first EBMP survey since they have both proceeded down a similar path. Much as the program came to a crossroads in its environmental technology transfer evolution, the City of Chattanooga also reached a critical juncture in its environmentally-influenced economic development. A city with a heavy manufacturing base, Chattanooga was designated in 1969 by the then-U.S. Health, Education and

Welfare Department as one of the most polluted cities in the United States. Since that critical turning point, Chattanooga has evolved into a benchmark for environmental improvement with a strong commitment to sustainable development through economic growth. The City's long and sometimes painful journey was recognized in 1990 when the EPA commended Chattanooga for its clean air, and in 1995 designated it on Earth Day as America's most improved city.

What makes this turnaround effort so significant – and which influenced the EBMP survey – was the concerted effort between government, business organizations, and the community to work together first on individual problems, then as part of a more coherent "vision" for Chattanooga's future. What became apparent during the late 1960s to early 1980s was that the citizens wanted not just change, but continuously maintainable development so that protection of the environment incorporated economic growth and quality of life for all of Chattanooga. This evolutionary initiative, begun in the late 1960s, became an infusive vision manifested in several programs such as the Chattanooga Venture, the Chattanooga Neighborhood Enterprise, the Greenway initiative, Riverpark, and the Electric Bus program.

Chattanooga, Tennessee is located at the juncture of the states of Tennessee, Georgia and Alabama and is surrounded by the southern Appalachian mountains and Cumberland Plateau. Nestled in the heart of the Tennessee River Valley, Chattanooga is home to more than 152,000 people and is part of Hamilton County that supports a population in excess of 285,000. The City's economic base includes a diverse group of businesses including Coca-Cola, Moon Pies, Brock Candies, Olan Mills, Provident Insurance, Dixie Yarns, and numerous heavy industry representatives.

Over the last 27 years, Chattanooga has undergone substantial changes with strong support from public/private campaigns. Government, business, and civic leaders provided the basis for new community-enhancement programs through the Chattanooga Venture, a not-for-profit organization designed to facilitate the community's involvement in the City's future. This tool has not only helped citizens address the important strategic issues for the community's vitality, but also acted as a catalyst for change. The Chattanooga Venture served as an incubator for major improvement programs such as Vision 2000, the Chattanooga Neighborhood Enterprise, and the RiverCity Company before they migrated to the community.

Vision 2000 marked the turning point for the community by soliciting input from the citizens on where they wanted to see Chattanooga's future go. More than 1,700 people participated in open meetings, bringing to the City's leaders' attention those issues that were critical to the growth and quality of life for all who called the City home. These 40 goals translated into projects to address family violence, renovation of a local theater, the opportunity for all to have decent and affordable housing, and cleanup of the downtown riverfront area. This highly successful grassroots input from community citizens is a benchmark for other communities that want to develop a comprehensive process that is supported by decisive citizens.

In support of one Vision 2000 goal, the Chattanooga Neighborhood Enterprise was organized as a nonprofit association between city, federal, state and local institutions to develop, finance, and renovate affordable housing for low-to-moderate income citizens. The community had identified the deteriorating condition of older, inner-city homes as a significant concern and a major obstacle to the quality of life. As a result, the Chattanooga Neighborhood Enterprise went to the top of the City's agenda for immediate address. Consequently, more than 3,000 units have been produced or rehabilitated.

Chattanoogaans also evaluated the assets deserted by factories and foundries along the Tennessee River and developed a "Greenway" path along the riverfront, creeks, and scenic corridors. A physical and spiritual reconnection to the Tennessee River that runs through downtown Chattanooga was fundamental for the City's inhabitants. Vital to the overall spirit of the city, the riverfront also represented major economic possibilities. Many programs and improvements were implemented including revitalization of buildings into shopping areas and theaters, construction of the world's largest freshwater aquarium, salvage and renovation of an historic bridge for pedestrian use, construction of a highly-popular riverwalk, and development of one of the nation's premier electric bus lines. These projects have produced enormous financial rewards and strengthened an esprit de corps among the population that has propelled Chattanooga into the national and international spotlight.

What began as a response to overwhelming problems has evolved into a highly successful, interrelated series of programs and projects for Chattanooga. Building on what matters to its citizens – the environment, quality of life, and sustainable growth – the City continues to canvass, analyze, and incorporate goals and objectives to ensure that its stays a model, environmentally-supportable city that listens and cares not just about the environment, but about the generations of Chattanoogaans who will inherit it.

Similarly, the BMP program continues to "ask the users" what they need and how the Best Manufacturing Practices

– and now its Environmental program – can provide information for the U.S. industrial base to remain globally competitive *and* environmentally attuned. The BMP program is proud to have the City of Chattanooga as its first EBMP survey site. This community's efforts echo BMP's mission by providing an exceptional example of government, industry, and people working together to improve the reliability of goods while enhancing the quality of life.

The BMP survey team considered the following practices to be among the best in industry, government, and communities.

Best Practices

The following best practices were presented at Chattanooga.

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CARTA/Electric Buses	7
When the City of Chattanooga realized that traffic and parking would pose major problems with the revitalization of the downtown area and the opening of the Tennessee Aquarium, it decided to use city-perimeter parking garages and free downtown transportation utilizing non-polluting, electric buses. Because the program has been so successful, it has become a test bed for other similar initiatives across the United States.	
Chattanooga Manufacturers' Association	7
The Chattanooga Manufacturers' Association is a proactive organization that addresses issues affecting the economic development and stability of the Chattanooga manufacturing industry.	
Curbside Recycling Collection Program	8
In support of its environmental and quality-of-life efforts, Chattanooga initiated a Curbside Recycling Collection Program in 1992 to provide residents with a curbside, pick-up recycling collection service. Collected materials are sorted, processed, and sold through a Materials Recovery Facility operated by Orange Grove Center, a sheltered workshop for the physically and mentally challenged.	
Economy Surplus Power for Wastewater Treatment	8
In 1989, the City entered into an successful agreement with the Tennessee Valley Authority to purchase Economy Surplus Power that would save the City tax dollars and still meet the power	

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requirements for operation of its Wastewater Treatment Plant.	
Greenways	8
During the late 1980s, the City began developing a high quality greenway path along the riverfront, creeks, and scenic corridors that connected housing, parks, businesses, and tourist attractions. With the completed greenways and another 75-100 miles planned for the future, the community has generated pride and enthusiasm that is considered a benchmark for other communities.	
Hamilton County Air Pollution Control Bureau	9
The Control Bureau was established to develop needed regulations, and is today governed by ten directors appointed by the Mayor and the County Executive. The Bureau has been highly successful because the legislative bodies understand and trust the consensus-building efforts which precede the recommendations.	
Riverpark	9
The Tennessee Riverpark provides an excellent example of a successful greenway in Chattanooga as well as illustrates the citizens' grass roots dedication. Riverpark is a catalyst for development and a focal point for residents, tourists, and businessmen.	
Stormwater Community Education Program	9
Chattanooga uses an innovative and successful program to educate its general public on the importance of preventing the introduction of pollutants into the natural waterways that run through the City.	
Warner Park Recycle Center	10
Warner Park Recycle Center is a city-owned and operated facility that provides a full service, drop-off recycle facility conveniently accessible to Chattanooga residents and businesses.	
Business Development/Business Incubator	10
Chattanooga restored a 125,000 square foot, abandoned building and developed it into a small business incubator to provide space and support services for new businesses. Of the 202 companies that have started business in the incubator	

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facility, 169 are still in business – a success rate of 83%.	
Chattanooga Neighborhood Enterprise	11
Established in 1986 to develop, finance, renovate, and manage affordable housing for Chattanooga and Hamilton County's low-to-moderate income citizens, the Chattanooga Neighborhood Enterprise provided the mechanism for City residents to have decent, suitable, and affordable housing.	
Chattanooga Venture/Community Vision	11
Chattanooga Venture is a not-for-profit organization that provides the means for citizen participation in establishing the agenda for the City's future and has been a primary catalyst for change.	
Converting Fleet Maintenance to an Internal Service	12
The City of Chattanooga consolidated its fleet maintenance operations to an activity-based center that provides services to other government departments while operating similar to a private enterprise.	
Environmental Court	12
The Environmental Court Docket was established in 1991 to address compliance to environmental ordinances and create a better environment within the City.	
Parks and Recreation Alliances with Nonprofit Groups and Private Industry	12
Chattanooga's campaign for the quality of life for its citizens is reflected in the expansion of the Parks and Recreation Department. Through discussions with related private concerns, over 50 nonprofit and private organizations have been used since 1994 to expand and improve services.	
Sustainable Development	13
An evolutionary initiative, begun in the late 1960s, helped guide Chattanooga from a city addressing specific problems to one with an infusive vision of sustainable development and growth. The City transformed a collection of community projects confronting independent issues into a cohesive program that improved Chattanooga's quality of life.	

Information

The following information items were presented at Chattanooga.

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High-Volume Low-Pressure Spray Guns and Cleaning Equipment	15
To mitigate some of the problems associated with maintaining nine paint booths and their related emissions, Choo Choo Customs, a customizer of vans and pick-up trucks, successfully replaced its paint spray guns with gravity-fed high-volume low-pressure guns; added gun wash systems for spray gun cleaning; and installed a computerized paint mixing system. This led to substantially reduced levels of emissions.	
Innovative Recovery and Use of Landfill Gases	15
The City of Chattanooga and a subsidiary of a locally-owned asphalt company agreed to use an innovative approach for the recovery and use of landfill gases at the City's Summit landfill to reduce the need for natural gas as a fuel.	
Moccasin Bend Wastewater Treatment Facility and Pretreatment Program	15
The Moccasin Bend Wastewater Treatment Facility serves more than 220,000 residents and 102 industrial dischargers including Chattanooga and its surrounding communities. The pretreatment program was established to address the wastewater composition's frequent and rapid fluctuations.	
Powder Coating of Castings	16
The Mueller Company began working with the Hamilton County Air Pollution Control Board to find ways to meet the new, stringent air emissions standards. Through cooperation and assistance, improvements in products and processes allowed Mueller to reduce its VOC emissions by installing a powder coating system for over 85% of its products.	
Stormwater Management Program	16
The City of Chattanooga was the first municipality in the State of Tennessee to develop internal ordinances and requirements to control erosion	

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and to obtain a National Pollution Discharge Elimination System permit.	
Better Housing Commission	17
The Better Housing Commission of Chattanooga is comprised of 15 citizens appointed by the mayor which meets monthly to determine whether to rehabilitate or demolish buildings in violation of the City's Minimum Housing Code.	
Chattanooga Police Department	17
A Community Policing initiative, begun in 1991, reflects Chattanooga's dedication to improving citizens' quality of life and has resulted in the reduction of the number of high crime areas from 152 to 27.	
Fair Housing	17
In 1986, the City of Chattanooga instituted a more proactive approach toward correcting discrimination in housing which had been an ongoing problem culminating in 1979 with a civil suit, brought by the NAACP and Tennessee Properties, against the City. The City developed its own Fair Housing ordinance and co-sponsored the creation of a Community Housing Resource Board.	
Head Start Program Innovation	18
The Chattanooga Head Start program has also "recycled" older buildings in its efforts to provide much-needed classroom space.	
Reuse of Structures	18
Chattanooga has innovatively provided recreational facilities for its citizens by revamping existing structures that had fallen out of use. This has presented opportunities to retain older historic structures as well as use newer ones that only require minor touch-ups.	
Scenic Cities Beautiful Commission	18
The Scenic Cities Beautiful Commission is a successful, joint effort between the City of Chattanooga and Hamilton County that has identified main sources of litter and helped change citizens' attitudes about maintaining a litter-free environment.	

Point of Contact

For further information on any item in this report, please contact:

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Section 2

Best Practices

Production

CARTA/Electric Buses

When the City of Chattanooga realized that traffic and parking would pose major problems with the revitalization of the downtown area and the opening of the Tennessee Aquarium, it decided to investigate the feasibility of electric buses. Although the City had considered trolley cars, diesel powered buses, and other alternatives, it wanted to support environmental efforts and avoid drawbacks associated with the other options.

Chattanooga enlisted a local retired manufacturing executive to perform the feasibility study, and he examined systems in California, England, and Switzerland. Santa Barbara, California was using electric buses; however, they would not perform well in Chattanooga because of significant differences in terrain. England and Switzerland were investigated because of the technologies being used to develop electric buses. Although the technology was available, no one could develop buses with the proper characteristics for use in Chattanooga.

Two buses developed using a new technology were made by a company in California. After initial operation, several changes were necessary, and the retired executive developed a new design incorporating an inventive, light-weight frame design and other weight saving features. The buses were built in Chattanooga.

The City contracts for two buses at a time, and the City participates with the manufacturer, Advanced Vehicle Systems, on the design team. New features and designs have been incorporated to enhance the operation with each contract; for example, changes have been made from DC motors to AC motors to provide more horsepower with the same range. Other changes under investigation include changing to a low voltage motor and incorporating a high efficiency air conditioning system.

The City is a test bed for the new designs where changes can be proven under actual operation, and there is a TVA test track nearby. The buses have been incorporated into 15 different cities, and by late 1996, Chattanooga will have 20 buses in operation. At the height of tourist season, up to 7,000 passengers per day ride the nine buses currently in use. Because the City constructed parking garages for patrons to leave cars, there is no fee to ride the buses. The operating funds for the buses come from the parking garage charges.

Chattanooga Manufacturers' Association

The CMA is a proactive organization that addresses issues affecting the economic development and stability of the Chattanooga manufacturing industry. With a membership of 240 representing 175 manufacturers, CMA represents the needs of its membership through a collective and united voice. A broad range of companies belong to the CMA, from large companies with 3,000 employees to small companies with five employees.

Chattanooga manufacturing is not as large of an industrial community as it was in the early to mid 1900s. However, manufacturing represents an important 23% of the Chattanooga economic base, and is an essential element of any plan for economic growth. The manufacturing culture has shifted, and the CMA recognizes that the future of manufacturing must address issues of environmental controls and equipment, computerization, robotics, mechanization, global competition, work teams, zoning regulations, product reliability, job requirements, waste reduction, Total Quality Management, Just-in-Time, and OSHA.

The CMA introduced "The Six Ps" – property, permission, processes, people, products, and profits – as core areas effecting change. For example, permission is no longer exclusively a legal issue; today the manufacturer must consider more stringent air, water, and solid waste regulations; bureaucratic difficulty in obtaining required installation and operating permits; increased numbers of government mandates; complicated zoning and site regulations; environmental equity, and other social issues. Processes are also no longer centered solely around previously strong foundry operations, food and food production, chemicals, machinery and metal fabrication, textile fibers and apparel production. The manufacturer must now account for process improvements that minimize waste at the source, pollution abatement equipment installation, mechanization and material handling practices, energy conservation practices, and introduction of alternatives for problem materials.

In cooperation with its members, its committees, community and industrial leaders, and the Chattanooga Chamber of Commerce, the CMA has effectively examined and developed courses of action to address issues identified from the "Six P" core areas that impact manufacturers. Typical issues addressed include challenging perceived unfair utility rates imposed on manufacturers, developing acceptable compliance with EPA's clean-air act, awareness of environmental regulations, and identifying

manufacturer's resource requirements to the academic community. The organization addresses issues that are justified while opposing practices that are bureaucratic excess. This association focuses energy on an issue, and objectively reaches a resolution. The CMA has repeatedly exercised more influence as a whole than manufacturers could individually.

Curbside Recycling Collection Program

In support of its environmental and quality-of-life efforts, Chattanooga initiated a Curbside Recycling Collection Program in 1992 to provide residents with a curbside, pick-up recycling collection service. Collected materials are sorted, processed, and sold through a Materials Recovery Facility operated by Orange Grove Center, a sheltered workshop for the physically and mentally-challenged. This Material Recovery Facility was constructed using federal, state, and corporate contributions, and the Orange Grove Center will share the revenue with the City, which will also pay Orange Grove \$3.00 per household per year.

The program uses Dual Blue Bags as the primary containers for recyclable materials. One bag is used for co-mingled waste paper (newspaper, mixed paper, and cardboard). The second one is used for co-mingled waste containers (plastic bottles and jugs, glasses, bottles and jars, and metal cans). To accomplish the recyclable material pick-up, the City changed its policy from two garbage pick-ups each week to one garbage pick-up and one Dual Blue Bag recyclable pick-up. Residents acquire their own blue bags which are available free from certain area merchants, or purchased for two to ten cents each.

The Curbside Recycling Collection Program averages 20% to 25% use per week, with some weeks peaking at 40%. As a result of this program, a 14% reduction in landfill is estimated to have resulted, and the Orange Grove Center can provide jobs for up to 100 mentally and physically-challenged clients; these jobs become part of their skill development program. The Orange Grove Connection helps motivate residents to participate in the recycling program, and provides continued educational opportunities and public awareness of the City's environmental agenda.

Economy Surplus Power for Wastewater Treatment

Because the Moccasin Bend Wastewater Treatment Plant in Chattanooga is a major user of electricity, it actively strives to cut costs and still maintain high levels of service to City residents and the immediate area. In 1989, the City entered into an agreement with the Tennessee Valley Au-

thority (TVA) to purchase Economy Surplus Power (ESP) from the TVA that would save the City tax dollars and still meet the power requirements for operation of the Wastewater Treatment Plant.

Under this agreement, the City agreed to a baseline of 3000 KW at regular rates and 3000 KW of ESP at greatly reduced rates. Any use by the City over the accepted total usage would carry significant penalties. In addition, the City agreed that TVA could interrupt (discontinue) the ESP at any time, requiring the treatment plant to cut back to a maximum of 3000 KW within five minutes. The City has experienced only two interruptions since 1994, and both interruptions were caused by unexpectedly high demands for electricity, thereby eliminating the surplus available to the City.

The ESP agreement has prompted the wastewater treatment plant personnel to become more cognizant of power usage and install safeguards to adjust processes and monitor use. The plant has also installed two, 35-million gallon equalization basins to handle sewage for treatment during peak requirements.

The savings realized in the first year amounted to \$357K to the City, and for 1995 equaled \$395K. As further improvements in monitoring and control systems are made at the treatment plant, outyear savings are expected to be even greater.

Greenways

During the late 1980s, Chattanooga began to evaluate the assets that had been abandoned by factories and foundries along the Tennessee River. A citizen's task group realized that the whole riverfront should be considered and include Moccasin Bend, a former location of the Cherokee Indian tribe encampments, as well as the downtown area. Consequently, partnerships with the Tennessee Valley Authority, private groups, and the local government created the first section of the Tennessee River Park.

A citizen's task force – the Greenway Board – was subsequently developed, and advocated a high quality greenway path along the riverfront, creeks, and scenic corridors that connected housing, parks, businesses, and tourist attractions. To assist in the planning and implementation, the City contracted with the Trust for Public Land, a nonprofit organization, to provide technical assistance, coordination, and land purchases, and land protection for the greenways. Land for the greenways and most of the easements have been donated.

Chattanooga is networking these greenways into a linear park reserved for environmental and recreational use. One greenway that follows the North Chickamauga Creek for more than four miles (of its proposed 15-mile route)

connects to the Greenway Farm, a 180-acre facility used as a park and which features a renovated mansion used as a conference center. On the south side of the Tennessee River, the 22-mile greenway is 40% complete and will eventually link the Chickamauga Dam with the Tennessee Aquarium.

Four other greenways will link the Tennessee Aquarium, parks, and neighborhoods while providing protected trails for people to ride bikes, jog, and walk. With the completed greenways and another 75-100 miles of greenway planned for the future, the community has generated pride and enthusiasm that is considered a benchmark for other communities.

Hamilton County Air Pollution Control Bureau

Following Chattanooga's designation in 1969 as one of the worst air polluters in the country, the City sought and received State approval to develop local air pollution control regulations. This was a significant effort as Chattanooga was eighth in the nation in manufacturing jobs per capita. It was also a transportation hub and home to many foundries, and locally available soft coal was the fuel of choice. The community acknowledged that success would require significant support of companies affected, and that local regulations must also comply with state and federal standards.

The Hamilton County Air Pollution Control Bureau was established to develop needed regulations. In an effort to obtain input from local manufacturers, draft regulations were shared with industry, of which the major stakeholder was the Chattanooga Manufacturers' Association (CMA). Significant effort was made to resolve issues with this highly respected and proactive group. Today, the Bureau is governed by ten directors appointed by the Mayor and the County Executive. It maintains a staff of 20 personnel, mostly engineers, with an annual budget of \$1.2M.

When reasonable consensus is reached, proposed regulations are recommended for approval by the 11 legislative bodies within the City and county. The Bureau has been highly successful because the legislative bodies and local industry understand and trust the consensus-building efforts which precede the recommendations. Although the Bureau is responsible for enforcement, it uses seminars, workshops, and information sharing with the community to facilitate compliance. Pollution prevention opportunities and best practices are shared with citizens and regulated industries. A central philosophy of the Bureau is that companies will reduce emissions if a competent, credible professional staff can demonstrate that cost savings will result from doing so.

Riverpark

The Tennessee Riverpark provides an excellent example of a successful greenway in Chattanooga as well as illustrates the grass roots dedication by a citizen to "return to the river." A local citizen and avid fisherman had a dream and maintained for over 20 years that every child should have an opportunity to fish, and his persistence is credited as a significant reason why state and City officials were eventually convinced to sponsor the project. As with the area's other greenway initiatives, a citizen's task group was appointed to study and define priorities for the Tennessee River corridor through Chattanooga. This park is a stretch of greenway with walkways, playgrounds, a rowing center, fishing piers, boat docks, and a 105-year old condemned bridge restored as the world's longest pedestrian bridge.

After addressing initial concern that building parks and connecting them was just a way for developers to make money, citizens embraced the 20-year Riverpark plan. With a projected cost of \$750M in 1985, \$150M was needed from the public coffers. A public/private partnership implemented the Riverpark plan, and local foundations and financial institutions raised \$12M in non-restrictive grant funds that were used as a revolving fund to assemble land, create plans, and serve as an incentive for public and private investments.

Riverpark is a catalyst for development including new industry, retail, office space, restaurants, museums, galleries, and housing. The Tennessee Riverpark is a focal point for residents, tourists, and businessmen – and with the Tennessee Aquarium as its main attraction – is indeed bringing people "back to the river."

Stormwater Community Education Program

Chattanooga uses an innovative and successful program to educate its general public on the importance of preventing the introduction of pollutants into the natural waterways that run through the City. Operating on a small budget, the program uses several approaches to inform citizens of the consequences of improper disposal of various materials that may empty into the waterways.

This public education effort started in 1992 with the distribution of a periodic newsletter, *The Clear Choice*. The newsletter focused on topics relating to stormwater management such as land-disturbing regulations, the federally-mandated National Pollutant Discharge Elimination System requirements, stormwater discharge permitting requirements, offers of Erosion Control classes, notification of awards won by the City for clean water activities, and other opportunities

for personal involvement underway.

A particular, targeted concern addressed by this newsletter and other educational efforts was the typical "out of sight, out of mind" attitude that often accompanied the improper disposal of some materials such as

- dumping car radiator antifreeze or engine oil down storm drains,
- performing car maintenance on city streets where leaking/drained fluids can end up in the storm drains,
- rinsing fuel spills from auto/truck accidents into storm drains,
- improper storage of discarded greases or cooking oils from restaurants, and
- uncontrolled erosion from construction sites.

Chattanooga also created a water quality mascot called Clear Choice (CC) Otter to use as an informative and concerned tutor in pamphlets and other simple instructional materials. In addition to the informative material, items such as drink bottles and visors have been created to keep CC Otter – and what he symbolizes – in the public eye. A highly-popular, costumed version of CC Otter participates in many civic functions such as Earth Day celebrations, local festivals, and scouting events to continue educational efforts.

Other important educational aspects of water quality are presented in kits available to the public such as a "Dump No Waste - Drains to Rivers" stencil for storm drain grills. Doorknob tags describing the problems with pollutants being dumped into storm drains are also available for distribution, and are used when a pollutant is regularly entering the storm drains from a particular neighborhood.

All public relations efforts are paid for by stormwater permitting fees, and amounts to approximately 5% of the total Stormwater Management Department budget. Estimates placed at 60,000 local people have been directly reached since 1993 through the education and outreach programs, with a significant number being reached through the indirect programs. As a result, Chattanooga's residents continue to become more environmentally conscious and protective of their natural resources.

Warner Park Recycling Program

The Warner Park Recycle Center is a city owned and operated facility that provides a full service, drop-off recycle facility conveniently accessible to Chattanooga residents and businesses. The Center also has a dynamic Outreach Program designed to encourage waste reduction, as well as a recycling and a Recycle Express Program to bridge the collection gap.

Started in 1991, the Recycle Center at Warner Park accepts Type I and II plastics, aluminum can, lumber,

recyclable paper, and glass and is manned and open six days a week. The facility collected 1,600 tons of recyclable material in 1995 which amounted to \$100K in revenues from sale of the materials.

Besides providing a collection site for residents and businesses, the Center has an Outreach Program designed to encourage and educate its citizens in waste reduction and recycling. This service includes providing speakers at various public and private functions, performing audits, and participating in school programs. Another program created by the Warner Park Recycle Center is the Recycle Express Program which the City provides as a special collection service for residents and businesses that lack the resources to deliver their materials to the drop-off facility. One major barrier to recycling is material collection, especially for businesses, nonprofit agencies, and government activities. Many want to recycle but lack the resources to deliver their materials to the drop-off facility. The Recycle Express Program was developed to bridge this collection gap. The City serves over 175 clients through this program including free material collection, a waste audit, program start-up assistance, and employee education. Clients provide their own collection containers and the City schedules pick-up to accommodate the individual client.

The Warner Park Recycle Center's recycling activities are in compliance with the Tennessee Solid Waste Act of 1991. The Center has provided effective waste management services to its residents, reduced waste going to landfills, provided recycling opportunities to its residents, and developed and facilitated markets for its recyclable materials.

Management

Business Development/Business Incubator

When 3M moved out of Chattanooga in the early 1980s, the company left a 125,000 square foot building in deteriorating north Chattanooga. The local economic development agency restored the building in 1988 and developed it into a small business incubator to provide space and support services for new businesses. The funding for the facility is provided by the Economic Development Administration and City/county matching funds.

The facility now contains 50 offices and 30 manufacturing spaces, with office spaces between 130 and 1,300 square feet and manufacturing spaces between 400 and 8,000 square feet. Spaces are rented below market value, and the rental rate increases by \$0.50 per square foot per year during the three-year incubation period. Companies qualify as tenants if they are in their first year of existence, operated by people possessing good character and credit worthiness, demonstrating good business planning sense, demonstrating the ability to outgrow and move from the center after three years,

and are designated a for-profit company.

Support services provided to the tenants at no charge include janitorial services, business planning assistance, loan packaging assistance, use of conference rooms and overhead projectors, on-site postal boxes, notary public, security, parking, volunteer counseling, and pick-up of mixed paper for recycling. The companies are charged for utilities, garbage disposal, business property tax, clerical support, copier charges, faxing capabilities, and on-site bookkeeping services. A library, video center, and computer center are also available for use at no charge. In addition, over 100 professional volunteers provide assistance to the companies as needed.

There are 65 companies currently located in the facility, 46 of which are service related, and 19 manufacturing related. Total employment for all companies currently in the facility is 367, and 104 companies have graduated out of the incubator with 850 employees. The cumulative sales of these start-up companies has amounted to \$125M. Of the 202 companies that started business in the incubator facility, 169 are still in business – a success rate of 83%.

Chattanooga Neighborhood Enterprise

The Chattanooga Neighborhood Enterprise (CNE), Inc. was one of the private, nonprofit organizations created through the Vision 2000 initiative. The community had identified through Vision 2000 that the deteriorating condition of older, inner-city homes was a significant concern, was a major obstacle to the quality of life, and should be part of Chattanooga's agenda for immediate address. Established in 1986 to develop, finance, renovate, and manage affordable housing for Chattanooga and Hamilton County's low-to-moderate income citizens, CNE provided the mechanism for City residents to have decent, suitable, and affordable housing.

CNE has used both public and private resources to improve or finance housing. The City committed funds to be used for homeowner rehabilitation loans, while the county later participated in issuing mortgage revenue bonds offering financing for first-time buyers of homes by low or moderate income families. Banks, private foundations, and other businesses have since become investors and provide favorable loan rates due to the strong financial history of the enterprise.

CNE has received support from the City, Hamilton County, the Lyndhurst Foundation, Tennessee Housing Development Agency, U.S. Department of Housing and Urban Development, and local banks and financial institutions. These groups have enabled the organization to produce, rehabilitate, or finance more than 3,600 housing units, representing an investment of over \$90M. The enterprise also owns and/or manages approximately 300

units of affordable rental housing and provides home improvement loans for existing homeowners.

Chattanooga Venture/Community Vision

Chattanooga Venture is a not-for-profit organization that provides the means for citizen participation in establishing the agenda for the City's future. This organization has been a tool that has also helped address strategic issues for the community's vitality, as well as served as a catalyst for change. Formed in 1984, Chattanooga Venture is founded on the premise that – as with other communities facing the same difficulties as Chattanooga – success is based on a comprehensive process that incorporates ideas from the community, and is supported by decisive citizens who form coalitions to implement the changes.

Vision 2000 marked the Venture's first effort – a public, goal-setting process that was contributed to by more than 1,700 people over a 20-week period. It resulted in more than 40 goals for the City, many of which supported the citizens' emphasis on the quality of life. Nonprofit organizations such as Partners for Academic Excellence, Chattanooga Neighborhood Enterprise, and RiverCity Company were supported at Chattanooga Venture before moving out into the community. Neighborhoods were linked by a city-wide network that urged residents to share responsibility for where and how they lived. Projects highlighted by the Vision 2000 effort prompted immediate response through the formation of task forces to address the goals. For example, the Family Violence Shelter was one of the first projects completed, and more than \$500K was raised by a citizens task force to start the shelter. The community raised enough funds after six months to open the center and support it for five years. Another coalition of local residents raised the \$6M needed for renovation of the historic Tivoli Theatre; and another group of Chattanoogaans, working to establish the Bessie Smith Hall as a center for jazz, blues and gospel performances, received their first funding from the state of Tennessee.

Vision 2000 resulted in more than 200 projects and programs, created 1,381 jobs, 7,300 temporary construction jobs, served over 1.5 million people, and precipitated a total financial investment of \$793,303,813.

Building on Vision 2000's success and planning for the future, ReVision 2000 was initiated in 1993 where nine meetings drew 2,600 participants and resulted in 3,000 ideas, which in turn produced 27 goals and 122 recommendations. The next visioning activity, Millennium III, is scheduled to begin in late April 1996.

Chattanooga Venture has been successful because of community involvement and support. This successful effort has helped break down barriers of race, history, and geography, and fostered the conviction that individual

citizens' ideas and participation in the process is critical to the program's success.

Converting Fleet Maintenance to an Internal Service

The City of Chattanooga consolidated its fleet maintenance operations to an activity-based center that provides services to other government departments while operating similar to a private enterprise. For 20 years, Chattanooga operated two municipal garages and gasoline stations for its public works, and fire and police operations. Both garages were budget-driven departmental systems, which typically neglected addressing operations as an enterprise. Expenditures were not justified, record keeping was inadequate, preventive maintenance was not followed through as prescribed, vehicle down time was high, inventories were suspect, and mechanic skill levels were declining.

In 1993, the City initiated a five-year plan to convert fleet maintenance to an internal service or activity-based center. The objective was to provide specialized management focus on fleet maintenance operations and systematically provide services to all departments. The conversion was built on existing strengths including the Mayor's support, a \$1M start-up fund, employees and facilities that were in place, a captive customer base, and the willingness of employees and management to make change. Obstacles included inexperience in enterprise operations, inadequate recordkeeping, the need to justify expenditures, and low mechanic skill levels. With proper controls imposed, the opportunity to reduce costs of fleet maintenance operations could be realized.

The conversion process is ongoing, although the activity-based center has already reduced operating costs to 70% of the average commercial vehicle maintenance costs. There are other substantial changes. Funds for garage operations and gasoline stations have been removed from the general budget, and individual users now include maintenance and gasoline in their own departmental budgets. Computerization of shop operations tracks work orders, labor costs, and inventory. Productivity and efficiency relative to national standards are calculated for each job. The inventory system determines part mix, Economic Order Quantity, and provides vendor analysis.

Management training includes accounting practices, basic supervision, task cycle management, and mentoring. All mechanics are on a career path to become SAE Certified. The team concept has been introduced and decision-making has been decentralized. Mechanics are encouraged to collect data, analyze it, make decisions, and act on decisions. Safety committees have been formed for employees to effect their safety and health. Profit and loss statements are communicated with employees, and team

captains meet regularly with management.

Parts inventory of the former fire and police garage has been reduced from \$750K to \$350K, and the former public works garage has been reduced from \$900K to \$500K, equating to an annual savings of \$400K. Labor productivity has increased from an estimated 45% to an average of 85%. Databases have been established to predict vehicle system failures, and preventive maintenance is now fully on schedule. Maintenance cost has been improved from 70% of private enterprise rates for labor and parts to 60%.

Environmental Court

The Environmental Court Docket was established in 1991 to address compliance to environmental ordinances and create a better living environment within the City. Prior to this time, Chattanooga had little ability to enforce compliance with housing, zoning, and building ordinances. Although cited in court, cases were not given the same consideration by judges as other cases, thereby making enforcement difficult and leaving inspectors disillusioned and helpless. The docket was crowded with more serious criminal or traffic offenses that required the court's attention. The condition continued to deteriorate and the number of violators increased.

One afternoon each week was set aside to hear only these environmental cases, allowing the court to send a clear message that Chattanooga was going to clean itself up. In addition to hearing the cases in the courtroom, the judge has held on-site hearings (as necessary) to better understand the alleged ordinance violations and ensure fair and equitable treatment to all parties.

Since the Environmental Court Docket was established, the City has seen the compliance rate increase from 38% to 87%, City inspectors have renewed conviction in their jobs, and communities in Chattanooga are being restored. Safer and cleaner houses are made available to citizens, and the number of illegal dump sites has been greatly reduced.

Parks and Recreation Alliances with Nonprofit Groups and Private Industry

Chattanooga's campaign for the quality of life for its citizens is reflected in the expansion of the Parks and Recreation Department. The department previously offered only basic, traditional programs because of limited resources, and clientele was normally limited to the poor inner-city. However, through Vision 2000, where the community reaffirmed that its recreational department was a quality of life ingredient, and because of changes in the local government, Chattanooga set out with objectives to use its recreational resources as much as possible and not duplicate services. Consequently, discussions with related

private concerns were initiated where there was an interest in building a partnership. Over 50 nonprofit and private organizations have been used since 1994 to expand and improve services.

An example of these alliances is provided by a partnership established between the department and the Trust for Public Land to support the Greenway initiative. The relationship has saved the City over \$60K annually and provided resources not locally available. The Trust for Public Land purchased the Greenway Farm, a 180-acre tract along the river slated for condominium development. With this purchase, the Greenway was extended, development for condominiums was halted, and a mansion on the property was converted into a Greenway Farm conference center for environmental education programs. A similar relationship was established with The Nature Center to provide oversight of the conference center and provide the environmental education programs. As a part of the lease, the City can bring inner-city children to the environmental education programs free of charge.

As a result of a community interests survey, the City wanted to develop a climbing wall to educate citizens and help them develop climbing skills. A local outdoor supply company also wanted to provide a training facility for rock climbing. The City consequently leased a pier of the walking bridge to this company to develop the facility. The company provided the initial capital investment and the annual operating funds. A clause in the lease stipulates that the company provide over 400 hours of free instructional time to recreation participants from the inner city.

The success of the involvement of the nonprofit and private companies can be attributed to the quality-of-life issues Chattanooga is espousing, as well as the City actively seeking out partners, publicity from the two local newspapers, and the grassroots efforts to involve the community.

Sustainable Development

An evolutionary initiative begun in the late 1960s helped guide Chattanooga from a city addressing specific problems to one with an infusive vision of sustainable development and growth. Responding to a U.S. Health, Education and Welfare designation as the worst polluted city in the country in 1969, Chattanooga made a commitment to transform the City's reputation by first confronting independent issues. In time, those issues became interde-

pendent and subsequently evolved into a collection of community projects that improved Chattanooga's quality of life. Specific issues of address included industrial pollution, fair and better housing, downtown transportation enhancement, clean-up of the river, business development, cultural facilities, and disabled adult workers. Chattanooga maintains that sustainable development has best been defined as a way to implement economic development while saving natural resources and respecting environmental concerns.

One example of this commitment was the reconnection to the Tennessee River that runs through the City and that has long been considered its lifeblood. To that end, the Tennessee Aquarium was constructed – providing an unanticipated appeal for students, researchers and visitors and attracting more than *one million visitors* in its first six months of operation. It generated \$133M in documented economic activity from an initial, private investment of \$45M. The condemned Walnut Street Bridge was also restored and developed into a park-like pedestrian bridge spanning the river with aesthetically landscaped walkways and parks along the riverbanks. This bridge provided easy access to downtown businesses, shops, restaurants and museums.

Community leaders also emphasized inner-city issues related to housing and neighborhood improvements as well as development of new business incubation facilities. Projects were planned with input from the community through town meetings and were implemented with cooperation from City, county, federal, civic, and industrial organizations. The catalyst for initiating many project activities came from foundation grants, donated facilities, benchmarking community problems against other communities having similar problems, and creative problem solving.

The City keeps initiatives energized by combining clusters of problems and taking advantage of federal grants, private donations, and revenues from tax referendums that are considered community investments. Sustainable development and growth is an ongoing, work-in-process effort that is gaining support from the local manufacturing industry which constitutes 23% of Chattanooga's economic activity. It also continues through many community activities and projects including the Millennium III planning process. Millennium III is a community participation, goal-setting process that focuses on Chattanooga's social and economic needs and helps establish final goals and projects for the 21st century.

Section 3

Information

Production

High-Volume Low-Pressure Spray Guns and Cleaning Equipment

To mitigate some of the problems associated with maintaining nine paint booths and their related VOC and cleaning emissions, Choo Choo Customs, a customizer of vans and pick-up trucks, replaced its paint spray guns with gravity-fed, high-volume low-pressure (HVLP) guns; added gun wash systems for spray gun cleaning; and installed a computerized paint mixing system.

Besides the VOC emissions, paint costs were constantly rising; any modifications to the process could trigger further regulatory limits; and approximately 40% of the paint used was being wasted in overspray. The HVLP spray guns reduced overspray from 40% to 20%, creating almost 30% in paint savings per year and considerably reduced VOC emissions. The gun wash system which was installed further reduced the VOC emissions and reduced costs. The computerized paint mixing system, a commercial system manufactured by PPG, allowed the company to mix as little as one ounce of custom paint at a time. This controlled mixing and the gravity-fed HVLP spray guns further reduced paint usage.

Innovative Recovery and Use of Landfill Gases

The City of Chattanooga and Soil Restoration and Recycling (SR2), a subsidiary of a locally-owned asphalt company agreed to use an innovative approach for the recovery and use of landfill gases at the City's Summit landfill. The concept uses landfill gases, ~60% methane, to thermally desorb and oxidize organic contaminants from petroleum contaminated soils. SR2 currently remediates petroleum contaminated soils using purchased fuels. The organic contaminants are thermally desorbed and then incinerated. In the Chattanooga approach, methane recovered from the Summit landfill will fuel the thermal desorption and incineration operations. Secondary heat from these operations will be used to dry and sterilize biosolids from the POTW without degrading its value as plant food.

The innovative activity benefits all parties. SR2 and its clients will profit from the use of low cost fuel to remediate petroleum contaminated soils. The POTW will recover waste heat to convert biosludge to a marketable product

while reducing landfill disposal of biosolids. The SR2 system is mobile and has been used to remediate a number of contaminated sites. The parties have signed a 15-year contract with provision for three five-year extensions. The system is expected to be operational late in 1996. The Summit landfill currently generates an estimated four million cubic feet of gas per day and has an expected gas production life cycle of over 30 years.

Moccasin Bend Wastewater Treatment Plant and Pretreatment Program

The Moccasin Bend Wastewater Treatment Plant serves more than 220,000 residents and 102 industrial dischargers including Chattanooga and its surrounding communities. Typical loading is approximately 50 million gallons per day (gpd) and up to 220,000 pounds per day as biological oxygen demand; collection is complicated by the Tennessee River and the extreme and difficult topography. In 1976, when the Publicly Operated Treatment Works (POTW) was established, Chattanooga was eighth nationally in percent of its population engaged in manufacturing and 19th nationally in the diversity of its industrial base. Wastewater composition was therefore subject to frequent and rapid fluctuations.

To help alleviate these problems, the POTW first conducted special samplings to establish the characteristics of normal domestic wastes. It then worked with the Chattanooga Manufacturers' Association to establish pretreatment standards which protected the POTW from upset while providing close and stable standards for industry. (Of 37 parameters established in 1976, only the silver parameter has changed.) These standards were accepted by EPA in 1982 – the first pretreatment standards accepted in the region.

Permits are now enforced through self-monitoring, random sampling, and on-site inspections by the POTW-budgeted staff of 123 which includes one pretreatment coordinator, one inspector, and three sampling technicians. Surcharges to industry provide \$2M per year of the \$27M per year operating budget.

The POTW includes two large aerated equalization basins (35 million gallons each) and a pure oxygen activated sludge digester. The sludge processing operations produce about 300 wet tons per day (five-day week basis) of Class B sludge for landfill disposal and limited land applications. An elaborate automated filter press provides filter cakes of >35% solids.

Powder Coating of Castings

The Mueller Company in Chattanooga, a manufacturer of water valves for water handling requirements, operates its own foundry for casting iron bodies and consequently maintains 26 environmental permits, seven of which are painting permits. To respond to a 1984 environmental law limiting volatile organic compound (VOC) emission, Mueller began working with the Hamilton County Air Pollution Control Board to find ways to meet the new, stringent standards. Through cooperation and assistance, the company was able to come into compliance. Improvements in products and processes allowed Mueller to further reduce its VOC emissions by installing a powder coating system for over 85% of its products.

Figure 3-1 illustrates the powder coating process line that the company installed and began operating in 1994. The addition of this line and replacement of non-environmentally friendly processes has produced savings of \$100K-\$200K per year for Mueller while continuing to reduce the emissions of VOCs.

Stormwater Management Program

The City of Chattanooga was the first municipality in the

State of Tennessee to develop internal ordinances and requirements to control erosion and to obtain a National Pollution Discharge Elimination System (NPDES) permit.

Chattanooga took a proactive approach to stormwater management in 1988 with an initial goal controlling erosion for aesthetic purposes. These efforts resulted in a series of Best Management Practices to control erosion and sedimentation from land-disturbing activities. The Best Management Practices were documented in a manual and covered a variety of topics such as stabilization of denuded areas and soil stockpiles, establishment of permanent vegetation, protection of adjacent properties, sediment trapping measures, controlling off-site erosion, storm sewer inlet protection, and others. The Stormwater Best Management Practices manual also documented minimum City of Chattanooga stormwater control requirements for granting construction permits, and standards and specifications for a variety of conservation practices such as temporary gravel construction entrances, installation of various types of temporary sediment barriers, streambank stabilization, topsoiling, seeding/sodding, and others.

Chattanooga also uses a contractor certification program to ensure contractor awareness of the City's stormwater management requirements. The certification program has been a very successful education tool, as pre-

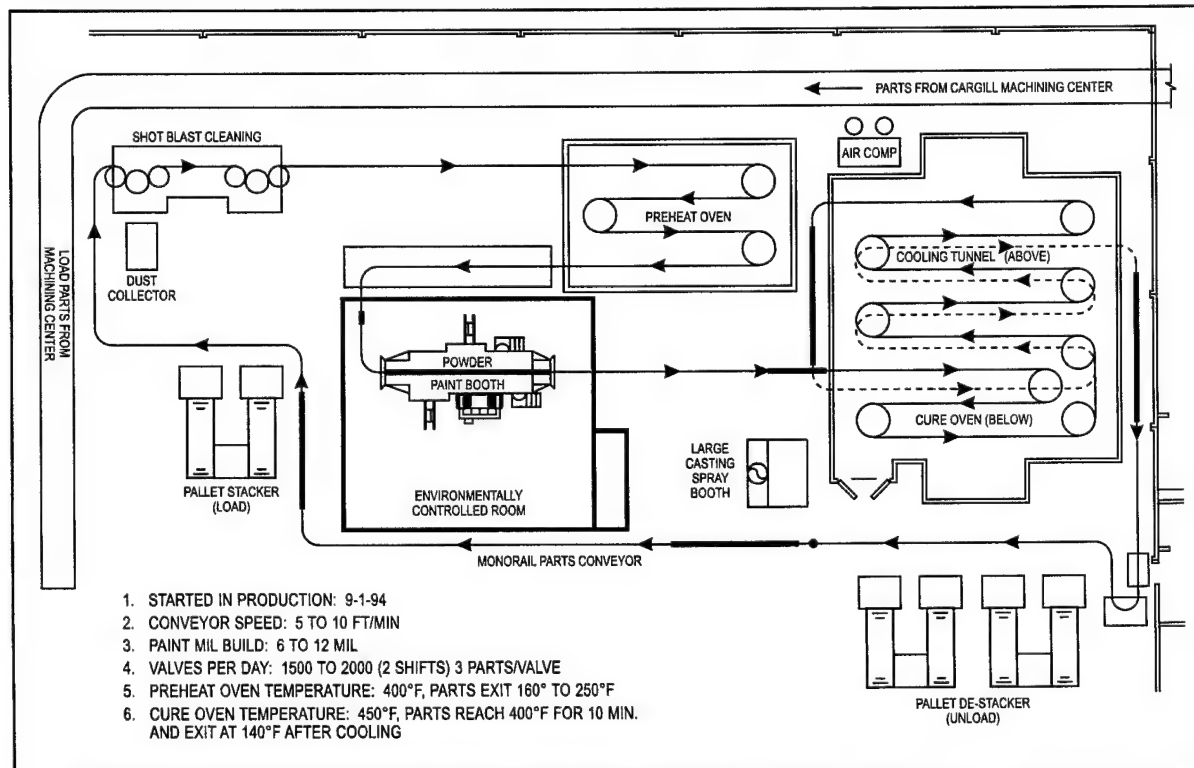


Figure 3-1. Powder Coating Process Line - Mueller Company

testing of contractors on the requirements has indicated a typical score of 50%, with a high majority of contractors passing the program's post-test to receive their certification. The City also employs five water quality analysts to inspect construction sites and take water samples.

Following the passage of the federal Clean Water Act in 1990, in order to comply with and obtain a NPDES permit from the State of Tennessee for stormwater discharges, the City of Chattanooga began a pollution prevention program to supplement the existing erosion/sedimentation control program for those businesses who are not specifically covered by the NPDES requirements. In the first two years of the program, Chattanooga has concentrated on working with approximately 600 service station and convenience store businesses to ensure that waste oil is properly disposed, that outdoor storage of scrap parts or material does not add pollutants in stormwater runoff, and adherence to other pollution prevention measures. From now until 1999, Chattanooga will expand the pollution prevention program to an additional 2,000 commercial and institutional businesses, as well as apartment complexes.

Chattanooga is cognizant of its role as a protector of the natural waterways that are an important feature of the City. The continuation of existing and initiation of new efforts to prevent additional pollution or sedimentation of these waterways, whether by regulations or public education, continue to be an important part of Chattanooga's environmental stewardship.

Management

Better Housing Commission

The Better Housing Commission (BHC) of Chattanooga, Tennessee is comprised of 15 citizens appointed by the mayor. The BHC meets monthly to determine whether to rehabilitate or demolish buildings in violation of the City's Minimum Housing Code. This Commission also works closely with the Police Department and Environmental Court in issuance of citations, condemnations, warnings, and violation letters to property owners.

Besides the seven code enforcement inspectors, four of whom are certified through the Southern Building Code Congress International, Inc., the BHC staff consists of support staff and management. The inspectors are responsible for enforcement of the Minimum Housing, Anti-

Litter and Overgrowth, and the Abandoned and Inoperable Vehicle Codes. In 1995, this staff addressed 6,484 complaints, 80% of which were complaints submitted by citizens, the remainder by administrators and inspectors. The BHC was able to recover \$37K of the City's costs to remove or demolish vehicles and structures.

The housing code was rewritten through an innovative benchmarking process, with findings from other cities and input from the seven code inspectors incorporated into a 32-page code passed by the City Council in late 1992. This better housing effort benefits the City by removing unsightly or dangerous structures, vehicles, and debris.

Chattanooga Police Department

A Community Policing initiative, begun in 1991, reflects Chattanooga's dedication to improving citizens' quality of life and has resulted in the reduction of high crime areas from 152 to 27. The Chattanooga Police Department is neighborhood oriented and works closely with the citizens to form a cooperative bond. In some neighborhoods, this may consist of working through neighborhood watch organizations, and in high crime areas, the police rely heavily on information given to them by residents who want to clean up their part of town.

In neighborhoods where drugs and prostitution are not significant problems, police take a proactive approach through organization of sports activities and participation in community events such as picnics. The police use an approach similar to Total Quality Management – or teaming – as is used in industrial settings. This may be done by interacting with residents individually or as a group.

Fair Housing

In 1986, the City of Chattanooga instituted a more proactive approach toward correcting discrimination in housing which had been an ongoing problem, culminating in 1979 with a civil suit brought by the NAACP and Tennessee Properties against the City.

To correct this situation, the City developed its own Fair Housing ordinance. At the same time, the City and HUD created a Community Housing Resource Board (CHRB). This board is composed of community members and realtors. The Board is responsible for promoting the concept of equal housing opportunities among realtors, landlords, tenants, lenders and the community at large. The program is administered for the City by the Equal Employment Opportunity/Fair Housing Office. Issues that are addressed include equal access to housing, tenant/landlord disputes, compliance with the Americans with Disabilities Act and Equal Employment Opportunity.

The CHRB uses several means of accomplishing its mission, such as dissemination of information outlined in an easy-to-read format on the rights and responsibilities of the different groups. The CHRB also employs two part-time Housing Information Hotline operators to answer questions.

Head Start Program Innovation

The Chattanooga Head Start program has also "recycled" older buildings in its efforts to provide much-needed classroom space. This space was obtained by taking over three City and two county schools that had been closed. The ability to undertake these efforts was supported by a collaboration with community partners in obtaining funding for the renovations, a new facility, land lease, and shared space.

The new facility, built in the section of the City where there was the greatest need, has space for 67 children with six classrooms, a nursery, and office spaces for counselors, speech therapists, and teacher preparation. The other renovated facility has space for 45 children and a shared space has a capacity of 53.

The Chattanooga Head Start Program has received state and national recognition for its program, and was one of the first 68 to receive an Early Head Start Grant. It was also one of the first 36 to receive a grant for an Infant, Toddlers, and Pregnant Women Program. The program has been able to initiate a "wraparound" child care program by receiving a state Department of Education Grant and a state grant for an Adult Literacy Program. There are currently 75 families participating in these vital programs. The highly successful Head Start program has been able to accomplish the reuse of buildings and establish new initiatives due to community partners and volunteers that staff the programs.

Reuse of Structures

Chattanooga City government has innovatively provided recreational facilities for its citizens by revamping existing structures that had fallen out of use. This has presented opportunities to retain older historic structures as well as using newer ones that only require minor touch-ups.

One example of the reuse of older structures is the City maintenance building which was converted into a recreation center and is now used by almost 10,000 people every

month. The facility has the added benefit of promoting better relations between various populations and income groups. Because of the location adjacent to downtown, its use helps bring together a cross-section of the City's population.

Likewise, an example of a newer structure is a shopping mall with a large unused area. Due to competition from larger malls and lack of easy interstate access, this structure was abandoned by several merchants. The City worked with the owner to secure some unused space and convert it to a recreation center for senior citizens. This effort was very successful, and future plans call for using other unused areas for a social security office and centers associated with the needs of senior citizens.

Scenic Cities Beautiful Commission

The Scenic Cities Beautiful Commission (SCBC) – a joint effort between the City of Chattanooga and Hamilton County – maintains two goals: to identify main sources of litter and to change attitudes regarding waste disposal. Initiated in 1962, the SCBC was tasked with developing a structured program addressing proper waste disposal. The only previous coordinated effort to address this problem was an annual, one-day clean-up event. This approach was inadequate in many ways including a failure to gain public support, and showed no connection between a clean city and economic development. It also had little support from public officials.

The SCBC coordinates with several other groups including the Better Housing Commission, Public Works Department, and educational institutions. Initiatives include continuous education through publications, maintaining currency in the latest waste disposal technology, and legislating and enforcing ordinances.

Benefits to the community include health and safety, a boost to tourism, economic investment in the community, and civic pride. The alleged cost benefit is \$7.76 returned for every \$1.00 of local support.

Appendix A

Table of Acronyms

Acronym	Definition
BHC	Better Housing Commission
BMP	Best Manufacturing Practices
CC	Clear Choice
CHRB	Community Housing Resource Board
CMA	Chattanooga Manufacturers' Association
CNE	Chattanooga Neighborhood Enterprise
EBMP	Environmental Best Manufacturing Practices
ESP	Economy Surplus Power
GPD	Gallons Per Day
HVLP	High Volume Low Pressure
NPDES	National Pollution Discharge Elimination System
POTW	Publicly Operated Treatment Works
SCBC	Scenic Cities Beautiful Commission
SR2	Soil Restoration and Recycling
TVA	Tennessee Valley Authority
VOC	Volatile Organic Compound

Appendix B

BMP Survey Team

Team Member	Activity	Function
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Sam Hart (423) 574-2501	Department of Energy Oak Ridge National Laboratories Oak Ridge, TN	

Appendix C

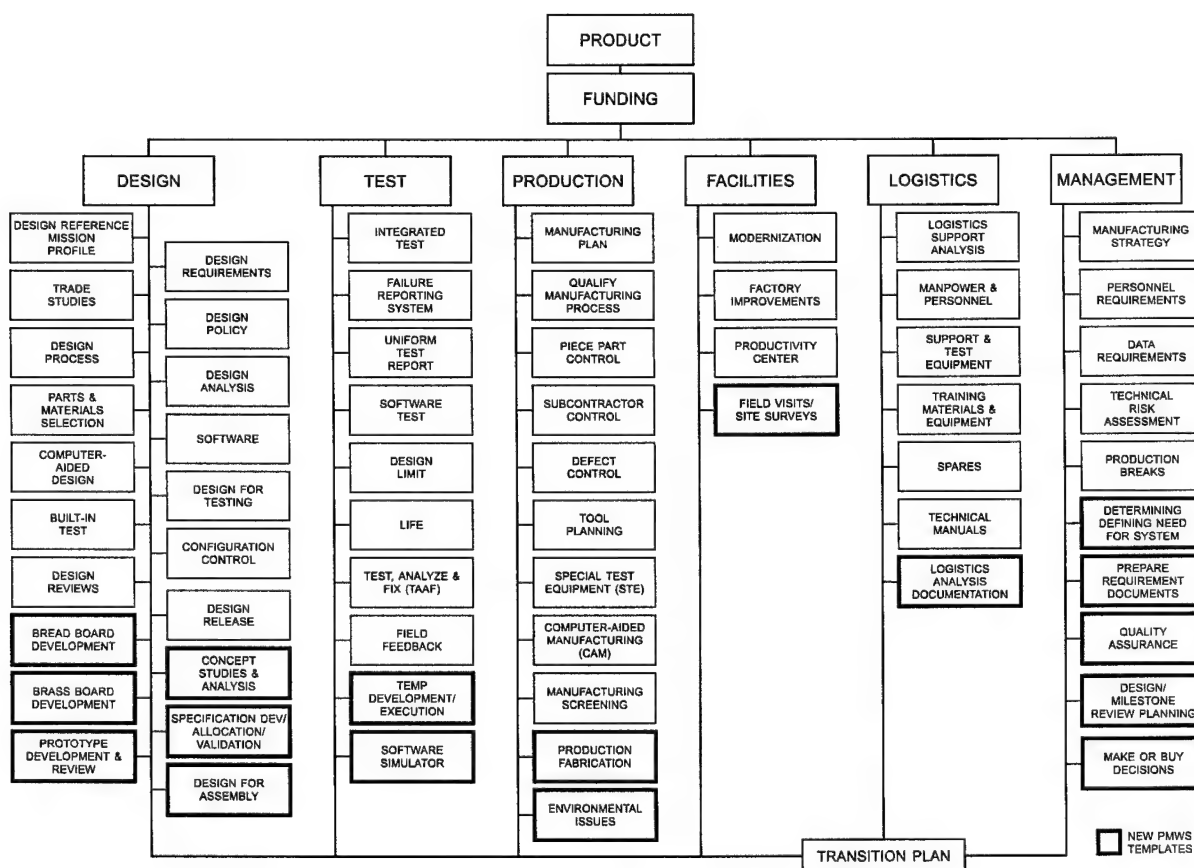
Critical Path Templates and BMP Templates

This survey was structured around and concentrated on the functional areas of design, test, production, facilities, logistics, and management as presented in the Department of Defense 4245.7-M, *Transition from Development to Production* document. This publication defines the proper tools—or templates—that constitute the critical path for a successful material acquisition program. It describes techniques for improving the acquisition process by addressing

it as an *industrial* process that focuses on the product's design, test, and production phases which are interrelated and interdependent disciplines.

The BMP program has continued to build on this knowledge base by developing 17 new templates that complement the existing DOD 4245.7-M templates. These BMP templates address new or emerging technologies and processes.

“CRITICAL PATH TEMPLATES FOR TRANSITION FROM DEVELOPMENT TO PRODUCTION”



Appendix D

BMPnet and the Program Manager's WorkStation

The Program Manager's WorkStation (PMWS) is a series of interrelated software environments and knowledge-based packages that provides timely acquisition and engineering information to the user. This WorkStation is hosted on the BMPnet that supports communication nationwide to promote technology transfer and continuous improvement. Access to BMPnet is through modem dial-in, free PMWS software, Internet, World Wide Web, or CD-ROM. Besides PMWS, BMPnet features include communication by electronic mail and file transfer; access to Special Interest Groups on more than 75 topics including producibility and Government specifications; information upload and download capability; and the ability to download BMPnet-resident programs.

PMWS includes **KnowHow**, an electronic library of expert technical assistance, including an intelligent search capability that gets the information users need on the screen in less than three minutes; the Technical Risk Identification and Mitigation System (**TRIMS**), a technical risk management system that may be tailored to the user's needs; the BMP database that contains over 2,000 abstracts on documented best practices; and SpecRite, a performance specification development tool.

KnowHow is . . . Knowledge through an automated and intelligent information access system that speeds the search for required information by up to 95%. Typically, the information needed is on the screen in less than three minutes.

KnowHow features include:

- Personalized acquisition planning guidance, both high and low level, as appropriate.
- Information required for user's specific job.
- Special, logic-driven menu that allows fast access to cut research time by up to 95%.
- On-line user's manual and help.
- Application as a learning tool for new acquisition personnel.

TRIMS brings . . . Insight which identifies and ranks those program areas with the highest risk levels.

TRIMS features include:

- Ability to conduct continuous risk assessments to take pre-emptive corrective action.

- Tracking capability for key project documentation from concept through production.
- Identification function of goals, personnel, and future activities in development processes.
- Default values for many categories by program type.
- Ability to tailor all fields to suit individual program requirements.
- Reports generation.

The **BMP Database** provides . . . Information that comes directly from verified practices in industry that government experts search out looking at the best to collect answers and solutions.

BMP Database features include:

- Information on best practices in manufacturing, design, test, facilities, production, management, and logistics from 80 companies or activities.
- Ability to search for information using a natural language interface.
- Capability to print information to a file, disk or directly to a local printer.
- Phone numbers of points of contact in companies who have been surveyed.

SpecRite can help . . . Develop a performance specification generator based on expert knowledge across the services to guide acquisition personnel in creating specifications for their requirements.

SpecRite features include:

- DOS-base (runs on any PC).
- Organization and structure for the build/ approval process.
- Knowledge-based guidance and assistance.
- Flexible, modular structure.
- Output in MIL-STD 961 format and in WordPerfect 5.1 files.

To access BMPnet via dial-in or on Internet, users need a special communications program. This program is obtained by calling the BMPnet Help Desk at (301) 403-8179 or via the World Wide Web at <http://www.bmpcoe.org>. If you want a personal account to receive e-mail, forward your request to the BMPnet Help Desk.

Appendix E

Best Manufacturing Practices Satellite Centers

There are currently six Best Manufacturing Practices (BMP) satellite centers that provide representation for and awareness of the BMP program to regional industry, government and academic institutions. The centers also promote the use of BMP with regional Manufacturing Technology Centers. Regional manufacturers can take advantage of the BMP satellite centers to help resolve problems, as the centers host informative, one-day regional workshops that focus on specific technical issues.

Center representatives also conduct BMP lectures at regional colleges and universities; maintain lists of experts who are potential survey team members; provide team member training; identify regional experts for inclusion in the BMPnet SIG e-mail; and train regional personnel in the use of BMP resources such as the BMPnet.

The six BMP satellite centers include:

Corona, CA

Chris Matzke

Quality Assurance Engineer
Naval Warfare Assessment Division
Code QA-21, P. O. Box 5000
1456 Mariposa Drive
Corona, CA 91718
(909) 273-4992
fax: (909) 273-5315
internet: cmatzke@bmpcoe.org

Louisville, KY

Marshall Bramble

BMP Representative
Louisville Site, Crane Division
Naval Surface Warfare Center
5401 Southside Drive
Louisville, KY 40214
(502) 364-5272
fax: (502) 364-5272
internet: mbramble@bmpcoe.org

Oak Ridge, TN

Tammy Graham

BMP Representative
Martin Marietta Energy Systems
P. O. Box 2009, Bldg. 9737
MS 8091
Oak Ridge, TN
(615) 576-5532
fax: (615) 574-2000
internet: tgraham@bmpcoe.org

Rockford, IL

Dean Zaumseil

Mid-Western Representative
3301 North Mulford Road
Rockford, IL 61114
(815) 654-5530
fax: (815) 654-4459
internet: adme3dz@rvcux1.rvc.cc.il.us

Vallejo, CA

Jack Tamargo

West Coast Representative
257 Cottonwood Drive
Vallejo, CA 94591
(707) 642-4267
internet address: jtamargo@bmpcoe.org

York, PA

Sherrie Snyder

Manager, Information Services
MANTEC, Inc.
P. O. Box 5046
York, PA 17405
(717) 843-5054
fax: (717) 854-0087
internet: snyderss@mantec.org

Appendix F

Navy Manufacturing Technology Centers of Excellence

The Navy Manufacturing Sciences and Technology Program established the following Centers of Excellence (COEs) to provide focal points for the development and technology transfer of new manufacturing processes and equipment in a cooperative environment with industry, academia, and Navy centers and laboratories. These COEs are consortium-structured for industry, academia, and government involvement in developing and implementing technologies. Each COE has a designated point of contact listed below with the individual COE information.

Best Manufacturing Practices Center of Excellence

The Best Manufacturing Practices Center of Excellence (BMPCOE) provides a national resource to identify and promote exemplary manufacturing and business practices and to disseminate this information to the U.S. Industrial Base. The BMPCOE was established by the Navy's BMP program, Department of Commerce's National Institute of Standards and Technology, and the University of Maryland at College Park, Maryland. The BMPCOE improves the use of existing technology, promotes the introduction of improved technologies, and provides non-competitive means to address common problems, and has become a significant factor in countering foreign competition.

Point of Contact:

Mr. Ernie Renner

Best Manufacturing Practices Center of Excellence

4321 Hartwick Road

Suite 400

College Park, MD 20740

(301) 403-8100

FAX: (301) 403-8180

ernie@bmpcoe.org

Center of Excellence for Composites Manufacturing Technology

The Center of Excellence for Composites Manufacturing Technology (CECMT) provides a national resource for the development and dissemination of composites manufacturing technology to defense contractors and subcontractors. The CECMT is managed by the GreatLakes Composites Consortium and represents a collaborative effort among industry, academia, and government to develop, evaluate, demonstrate, and test composites manufacturing technologies. The technical work is problem-driven to reflect current and future Navy needs in the composites industrial community.

Point of Contact:

Dr. Roger Fountain

Center of Excellence for Composites Manufacturing Technology

103 Trade Zone Drive

Suite 26C

West Columbia, SC 29170

(803) 822-3705

FAX: (803) 822-3730

frglcc@aol.com

Electronics Manufacturing Productivity Facility

The Electronics Manufacturing Productivity Facility (EMPF) identifies, develops, and transfers innovative electronics manufacturing processes to domestic firms in support of the manufacture of affordable military systems. The EMPF operates as a consortium comprised of industry, university, and government participants, led by the American Competitiveness Institute under a CRADA with the Navy.

Point of Contact:

Mr. Alan Criswell

Electronics Manufacturing Productivity Facility

Plymouth Executive Campus

Bldg 630, Suite 100

630 West Germantown Pike

Plymouth Meeting, PA 19462

(610) 832-8800

FAX: (610) 832-8810

<http://www.engriupui.edu/empf/>

National Center for Excellence in Metalworking Technology

The National Center for Excellence in Metalworking Technology (NCEMT) provides a national center for the development, dissemination, and implementation of advanced technologies for metalworking products and processes. The NCEMT, operated by Concurrent Technologies Corporation, helps the Navy and defense contractors improve manufacturing productivity and part reliability through development, deployment, training, and education for advanced metalworking technologies.

Point of Contact:
Mr. Richard Henry
National Center for Excellence in Metalworking
Technology
1450 Scalp Avenue
Johnstown, PA 15904-3374
(814) 269-2532
FAX: (814) 269-2799
henry@ctc.com

Navy Joining Center

The Navy Joining Center (NJC) is operated by the Edison Welding Institute and provides a national resource for the development of materials joining expertise and the deployment of emerging manufacturing technologies to Navy contractors, subcontractors, and other activities. The NJC works with the Navy to determine and evaluate joining technology requirements and conduct technology development and deployment projects to address these issues.

Point of Contact:
Mr. David P. Edmonds
Navy Joining Center
1100 Kinnear Road
Columbus, OH 43212-1161
(614) 487-5825
FAX: (614) 486-9528
dave_edmonds@ewi.org

Energetics Manufacturing Technology Center

The Energetics Manufacturing Technology Center (EMTC) addresses unique manufacturing processes and problems of the energetics industrial base to ensure the availability of affordable, quality energetics. The focus of the EMTC is on process technology with a goal of reducing manufacturing costs while improving product quality and reliability. The COE also maintains a goal of development and implementation of environmentally benign energetics manufacturing processes.

Point of Contact:
Mr. John Brough
Energetics Manufacturing Technology Center
Indian Head Division
Naval Surface Warfare Center
Indian Head, MD 20640-5035
(301) 743-4417
DSN: 354-4417
FAX: (301) 743-4187
mt@command.nosih.sea06.navy.mil

Manufacturing Science and Advanced Materials Processing Institute

The Manufacturing Science and Advanced Materials Processing Institute (MS&MPI) is comprised of three centers including the National Center for Advanced Drivetrain Technologies (NCADT), The Surface Engineering Manufacturing Technology Center (SEMTC), and the Laser Applications Research Center (LaserARC). These centers are located at The Pennsylvania State University's Applied Research Laboratory. Each center is highlighted below.

Point of Contact for MS&MPI:
Mr. Dennis Herbert
Manufacturing Science and Advanced Materials
Processing Institute
ARL Penn State
P.O. Box 30
State College, PA 11804-0030
(814) 865-8205
FAX: (814) 863-0673
dbh5@psu.edu

- **National Center for Advanced Drivetrain Technologies**

The NCADT supports DOD by strengthening, revitalizing, and enhancing the technological capabilities of the U.S. gear and transmission industry. It provides a site for neutral testing to verify accuracy and performance of gear and transmission components.

Point of Contact for NCADT:
Dr. Suren Rao
National Center for Advanced Drivetrain
Technologies
ARL Penn State
P.O. Box 30
State College, PA 16804-0030
(814) 865-3537
FAX: (814) 863-1183
http://www.arl.psu.edu/drivetrain_center.html/

- **Surface Engineering Manufacturing Technology Center**

The SEMTC enables technology development in surface engineering—the systematic and rational modification of material surfaces to provide desirable material characteristics and performance. This can be implemented for complex optical, electrical, chemical, and mechanical functions or products that affect the cost, operation, maintainability, and reliability of weapon systems.

Point of Contact for SEMTC:
Surface Engineering Manufacturing Technology Center
Dr. Maurice F. Amateau
SEMTC/Surface Engineering Center
P.O. Box 30
State College, PA 16804-0030
(814) 863-4214
FAX: (814) 863-0006
http://www/arl.psu.edu/divisions/arl_org.html

- **Laser Applications Research Center**

The LaserARC is established to expand the technical capabilities of DOD by providing access to high-power industrial lasers for advanced material processing applications. LaserARC offers basic and applied research in laser-material interaction, process development, sensor technologies, and corresponding demonstrations of developed applications.

Point of Contact for LaserARC:
Mr. Paul Denney
Laser Center
ARL Penn State
P.O. Box 30
State College, PA 16804-0030
(814) 865-2934
FAX: (814) 863-1183
http://www/arl.psu.edu/divisions/arl_org.html

Gulf Coast Region Maritime Technology Center

The Gulf Coast Region Maritime Technology Center (GCRMTC) is located at the University of New Orleans and will focus primarily on product developments in support of the U.S. shipbuilding industry. A sister site at Lamar University in Orange, Texas will focus on process improvements.

Point of Contact:
Dr. John Crisp
Gulf Coast Region Maritime Technology Center
University of New Orleans
Room N-212
New Orleans, LA 70148
(504) 286-3871
FAX: (504) 286-3898

Appendix G

Completed Surveys

BMP surveys have been conducted at the companies listed below. Copies of older survey reports may be obtained through DTIC or by accessing the BMPnet. Requests for copies of recent survey reports or inquiries regarding the BMPNET may be directed to:

Best Manufacturing Practices Program
4321 Hartwick Rd., Suite 400
College Park, MD 20740
Attn: Mr. Ernie Renner, Director
Telephone: 1-800-789-4267
FAX: (301) 403-8180
ernie@bmpcoe.org

1985	Litton Guidance & Control Systems Division - Woodland Hills, CA
1986	Honeywell, Incorporated Undersea Systems Division - Hopkins, MN (Alliant TechSystems, Inc.) Texas Instruments Defense Systems & Electronics Group - Lewisville, TX General Dynamics Pomona Division - Pomona, CA Harris Corporation Government Support Systems Division - Syosset, NY IBM Corporation Federal Systems Division - Owego, NY Control Data Corporation Government Systems Division - Minneapolis, MN
1987	Hughes Aircraft Company Radar Systems Group - Los Angeles, CA ITT Avionics Division - Clifton, NJ Rockwell International Corporation Collins Defense Communications - Cedar Rapids, IA UNISYS Computer Systems Division - St. Paul, MN (Paramax)
1988	Motorola Government Electronics Group - Scottsdale, AZ General Dynamics Fort Worth Division - Fort Worth, TX Texas Instruments Defense Systems & Electronics Group - Dallas, TX Hughes Aircraft Company Missile Systems Group - Tucson, AZ Bell Helicopter Textron, Inc. - Fort Worth, TX Litton Data Systems Division - Van Nuys, CA GTE C ³ Systems Sector - Needham Heights, MA
1989	McDonnell-Douglas Corporation McDonnell Aircraft Company - St. Louis, MO Northrop Corporation Aircraft Division - Hawthorne, CA Litton Applied Technology Division - San Jose, CA Litton Amecom Division - College Park, MD Standard Industries - LaMirada, CA Engineered Circuit Research, Incorporated - Milpitas, CA Teledyne Industries Incorporated Electronics Division - Newbury Park, CA Lockheed Aeronautical Systems Company - Marietta, GA Lockheed Corporation Missile Systems Division - Sunnyvale, CA Westinghouse Electronic Systems Group - Baltimore, MD General Electric Naval & Drive Turbine Systems - Fitchburg, MA Rockwell International Corporation Autonetics Electronics Systems - Anaheim, CA TRICOR Systems, Incorporated - Elgin, IL
1990	Hughes Aircraft Company Ground Systems Group - Fullerton, CA TRW Military Electronics and Avionics Division - San Diego, CA MechTronics of Arizona, Inc. - Phoenix, AZ Boeing Aerospace & Electronics - Corinth, TX

1990 (Continued)	Technology Matrix Consortium - Traverse City, MI Textron Lycoming - Stratford, CT
1991	Resurvey of Litton Guidance & Control Systems Division - Woodland Hills, CA Norden Systems, Inc. - Norwalk, CT Naval Avionics Center - Indianapolis, IN United Electric Controls - Watertown, MA Kurt Manufacturing Co. - Minneapolis, MN MagneTek Defense Systems - Anaheim, CA Raytheon Missile Systems Division - Andover, MA AT&T Federal Systems Advanced Technologies and AT&T Bell Laboratories - Greensboro, NC and Whippany, NJ Resurvey of Texas Instruments Defense Systems & Electronics Group - Lewisville, TX
1992	Tandem Computers - Cupertino, CA Charleston Naval Shipyard - Charleston, SC Conax Florida Corporation - St. Petersburg, FL Texas Instruments Semiconductor Group Military Products - Midland, TX Hewlett-Packard Palo Alto Fabrication Center - Palo Alto, CA Watervliet U.S. Army Arsenal - Watervliet, NY Digital Equipment Company Enclosures Business - Westfield, MA and Maynard, MA Computing Devices International - Minneapolis, MN (Resurvey of Control Data Corporation Government Systems Division) Naval Aviation Depot Naval Air Station - Pensacola, FL
1993	NASA Marshall Space Flight Center - Huntsville, AL Naval Aviation Depot Naval Air Station - Jacksonville, FL Department of Energy Oak Ridge Facilities (Operated by Martin Marietta Energy Systems, Inc.) - Oak Ridge, TN McDonnell Douglas Aerospace - Huntington Beach, CA Crane Division Naval Surface Warfare Center - Crane, IN and Louisville, KY Philadelphia Naval Shipyard - Philadelphia, PA R. J. Reynolds Tobacco Company - Winston-Salem, NC Crystal Gateway Marriott Hotel - Arlington, VA Hamilton Standard Electronic Manufacturing Facility - Farmington, CT Alpha Industries, Inc. - Methuen, MA
1994	Harris Semiconductor - Melbourne, FL United Defense, L.P. Ground Systems Division - San Jose, CA Naval Undersea Warfare Center Division Keyport - Keyport, WA Mason & Hanger Silas Mason Co., Inc. - Middletown, IA Kaiser Electronics - San Jose, CA U.S. Army Combat Systems Test Activity - Aberdeen, MD Stafford County Public Schools - Stafford County, VA
1995	Sandia National Laboratories - Albuquerque, NM Rockwell Defense Electronics Collins Avionics & Communications Division - Cedar Rapids, IA (Resurvey of Rockwell International Corporation Collins Defense Communications) Lockheed Martin Electronics & Missiles - Orlando, FL McDonnell Douglas Aerospace (St. Louis) - St. Louis, MO (Resurvey of McDonnell-Douglas Corporation McDonnell Aircraft Company) Dayton Parts, Inc. - Harrisburg, PA Wainwright Industries - St. Peters, MO Lockheed Martin Tactical Aircraft Systems - Fort Worth, TX (Resurvey of General Dynamics Fort Worth Division) Lockheed Martin Government Electronic Systems - Moorestown, NJ Sacramento Manufacturing and Services Division - Sacramento, CA JLG Laboratories, Inc. - McConnellsburg, PA
1996	City of Chattanooga - Chattanooga, TN

INTERNET DOCUMENT INFORMATION FORM

A. Report Title: Best Manufacturing Practices: Report of Survey
Conducted at City of Chattanooga, Chattanooga, TN

B. DATE Report Downloaded From the Internet: 12/11/01

**C. Report's Point of Contact: (Name, Organization, Address, Office
Symbol, & Ph #):** Best Manufacturing Practices
Center of Excellence
College Park, MD

D. Currently Applicable Classification Level: Unclassified

E. Distribution Statement A: Approved for Public Release

F. The foregoing information was compiled and provided by:
DTIC-OCA, Initials: __VM__ Preparation Date 12/11/01

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